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Narrative Review: Sexually Transmitted Diseases and Homeless Youth—What Do We Know About Sexually Transmitted Disease Prevalence and Risk?

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Abstract

Background—Homelessness affects an estimated 1.6 million US youth annually. Compared with housed youth, homeless youth are more likely to engage in high-risk behaviors, including inconsistent condom use, multiple sex partners, survival sex, and alcohol/drug use, putting them at increased sexually transmitted disease (STD) risk. However, there is no national estimate of STD prevalence among this population.

Methods—We identified 10 peer-reviewed articles (9 unique studies) reporting STD prevalence among homeless US youth (2000–2015). Descriptive and qualitative analyses identified STD prevalence ranges and risk factors among youth.

Results—Eight studies reported specific STD prevalence estimates, mainly chlamydia, gonorrhea, and syphilis. Overall STD prevalence among homeless youth ranged from 6% to 32%. STD rates for girls varied from 16.7% to 46%, and from 9% to 13.1% in boys. Most studies were conducted in the Western United States, with no studies from the Southeast or Northeast. Youths who experienced longer periods of homelessness were more likely to engage in high-risk sexual behaviors. Girls had lower rates of condom use and higher rates of STDs; boys were more likely to engage in anal and anonymous sex. Additionally, peer social networks contributed to protective effects on individual sexual risk behavior.

Conclusions—Sexually transmitted disease prevalence estimates among homeless youth fluctuated greatly by study. Sexually transmitted disease risk behaviors are associated with unmet survival needs, length of homelessness, and influence of social networks. To promote sexual health and reduce STD rates, we need better estimates of STD prevalence, more geographic diversity of studies, and interventions addressing the behavioral associations identified in our review.

In the United States, homelessness affects an estimated 1.6 million US youth annually.[1] The point-in-time count, a yearly attempt to hand count homeless persons in the United States, found that nearly 36,907 youth were homeless for a given single night in 2015, with 87%

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aged 18 to 24 years and 13% under the age of 18 years.[2] Sheltered homeless youth are defined as “individuals who are staying in emergency shelters, transitional housing programs or safe havens”; unsheltered homeless youth are “people who stay in places not meant for human habitation, such as the streets, abandoned buildings, vehicles, or parks.”[2] Youth may be forced or voluntarily leave home for various reasons, including family abuse, economic causes, and intrafamilial differences.[3,4] Once youth become homeless, they are at increased risk for multiple adverse health outcomes, notably sexual health related, such as sexually transmitted diseases (STDs) and human immunodeficiency virus (HIV).[5,6] Compared with housed youth, homeless youth are more likely to experience teen dating violence, teen pregnancy, and poor mental health.[7] Homeless youth are also more likely to engage in high-risk sexual behaviors, such as unprotected intercourse, multiple sexual partners, and drug and alcohol use, putting them at increased risk for acquiring STDs.[8]

Calculating accurate national estimates of STD prevalence among homeless youth is difficult, and currently unknown due to the population’s transience in and out of homelessness.[7] As of 2014, youth, ages 15 to 24 years, account for half of all the estimated 20 million new STDs each year.[9] Sexually transmitted disease prevalence rates among homeless youth are thought to be higher than among other youth due to homeless youth’s engagement in high-risk sexual behaviors in exchange for basic needs, such as food and shelter.[10] With no known national estimates for this population, researchers often cite prevalence rates from each other’s work leading to the reporting of STD rates ranging widely from 8% to 40%.[11]

Studies have explored behavioral risk factors associated with STD acquisition in homeless youth,[6,12] and there are reviews specific to HIV.[13,14] To date, however, no reviews have focused exclusively on STD prevalence or incidence among homeless youth in the United States. Here, we reviewed the published literature to document estimates of STD prevalence among homeless youth in the United States to contribute to a better understanding of the burden of STDs among this population. We also reviewed associations with behaviors that may put youth at higher risk for STD acquisition, and sought gaps in the literature.

METHODS

We conducted a review on homeless adolescents and STD prevalence rates by searching PubMed, MEDLINE, Ovid, and Google Scholar for articles published in English from 2000 through 2015. Search terms used included housing status (homeless, homelessness, transient living, street people), population of interest (adolescents, youth, young adults, street youth), terms related to sexual health outcomes (sexually transmitted diseases/infections, HIV/acquired immune deficiency syndrome, syphilis, gonorrhea, chlamydia, herpes, viral hepatitis), sexual risk associated with homelessness (sexual risk behaviors, high risk behaviors, risky behaviors), and STD rate (prevalence, incidence). Inclusion criteria included articles that were (1) English language, (2) published in peer-reviewed journals, (3) conducted in the United States, and (4) reported STD prevalence rates among homeless youth. Articles were excluded if the studies were conducted outside of the United States, STD prevalence was not reported, or only reported HIV prevalence.

The literature search identified 35 articles. References of articles were scanned for additional articles yielding 1 additional article. Data table elements were created and all authors reviewed 15% of the articles to ensure information extraction consistency. Remaining articles were each reviewed by 2 of the coauthors. Themes relating to homelessness, STD rates, and sexual risk factors were identified. After a full review of the 35 original articles, 26 were excluded for failing to meet inclusion criteria, resulting in a final data set of 9 articles (10 articles met the inclusion criteria however, 2 articles reported from the same sample, leaving 9 unique studies). While publication year of the final data set ranged from 2000 to 2013, study year ranged from 1994 to 2005. Reasons for exclusion included no report of STD prevalence (n = 20), articles reporting on the same study (n = 2), and review articles (n = 4). For articles reporting from the same study, we included the article that reported the most relevant and complete information, including the prevalence of STDs among the study population.

RESULTS

Participants and Inclusion Criteria

Settings included Minneapolis (n = 1), Denver (n = 1), San Francisco (n = 1), Los Angeles (n = 2), and Texas (n = 2), with no studies from the Southeast or Northeast. Authors of the 2 articles with unspecified geographic locations described study settings as “a large Northwestern city,” and “the United States.” Studies were primarily conducted in urban settings (n = 8), and 1 study did not specify setting.

Participant age ranged from 12 to 23 years. Eight studies included youth under the age of 18 years. Eight studies reported on gender, 7 reporting more homeless boys than girls in their sample (Table 1). The study that reported more girls than boys also reported the smallest proportion of white homeless youth.

Inclusion criteria varied across studies as did definitions of homelessness in regard to recency and length of time away from the home of a parent/guardian. Six articles did not define what constituted being homeless. Of the articles that did, definitions were not consistent and included: spending 2 consecutive nights but less than 6 months away from home without parent/guardian’s consent, being homeless for at least half the days in 1 month within a given year, not spending more than 30 days total with parent/guardian in the previous 6 months, and having to stay 2 or more nights at a place not considered your home. Although definitions were not consistent, youth across all studies were found through locations frequented by homeless youth, such as shelters, drop-in centers, known street venues, and transitional housing sites ensuring true, homeless status at the time of the study. Table 1 provides a summary of the characteristics of the studies included in this review.

Recruitment and Data Collection

Recruitment was primarily accomplished by outreach workers (n = 9) at settings where youth congregated such as drop-in centers, restaurants, street corners, meal-serving sites, parks, parking lots, service agencies, and youth shelters. Data were collected through audio computer-administered self-interview survey (A-CASI) (n = 3), self-report paper and pencil

survey (n = 3), or through structured interviews or interview administered survey (n = 3). Eight of the 9 studies provided incentives, typically monetary compensation ranging from US $10 to US $20.

STD Prevalence

Five articles reported on the overall STD prevalence estimates of study respondents (Table 2). The majority relied on self-report, resulting in STD prevalence estimates ranging from 6.4% to 32% (median, 13.2%). Four of the five further analyzed STD rates by sex, with rates ranging from 11% to 46% in girls (median, 17.9%) and 1.9% to 13.1% in boys (median, 6.9%).

Eight studies reported on STD specific rates. Studies collected data via self-report and/or through collection of biologic samples, such as blood and urine. Overall, chlamydia was the most commonly reported disease (n = 7) with a prevalence ranging from 2.8% to 18.3%. Among girls, the rates ranged from 6.45% to 31.7% and in boys, from 4.73% to 9.2%. In studies, where biologic samples were collected, rates of chlamydia ranged from 4.2% to 11.6% compared with 2.8% to 18.3% in studies where the data was self-reported. Gonorrhea prevalence was less frequently reported (n = 6), and not stratified by sex, ranging from 0.4% to 24.9%. Gonorrhea prevalence from biologic samples ranged from 0.4% to 11% and from 1.0% to 24.9% among self-reported data. Three articles reported syphilis and herpes prevalence with rates ranging from 0.2% to 3.5% and 1.1% to 11.8%, respectively. All articles reporting syphilis prevalence and all but 1 article citing herpes prevalence used self-report data. Prevalence of hepatitis B was reported in 3 articles and prevalence of hepatitis C was reported in 2 articles with rates ranging from 1.42% to 17% and 3.77% to 12%, respectively. All articles reporting on hepatitis C used biologic sample data as well as 2 of the 3 articles reporting on hepatitis B prevalence. One article reported genital warts prevalence at 3.5% (self-report data) and another study cited both human papilloma virus (HPV) prevalence at 1.3% and *Trichomonas vaginalis* prevalence at 0.7% (biologic sample data and self-report data).

STD Prevalence and Demographic Factors

Four articles examined associations between demographic factors, such as age, gender, sexual orientation, race/ethnicity, and STD status. Tevendale et al[23] found a greater percentage of girls reporting recent (prior 3 months) and lifetime STD diagnoses compared with boys (19.1% vs 1.9%, and 36.9% vs 13.1%, both $P < 0.01$). Girls also reported more unprotected sex acts (76.2% vs 61.7%, $P < 0.05$). Solorio et al[21] also found gender differences for sexual risk behaviors. Homeless female youth in that study reported higher STD rates and an increased likelihood of engaging in sex with a partner suspected of having an STD. Boys in the study were more likely to have 3 or more sexual partners and engage in anonymous and anal sex. Additionally, they found that older age was a positive predictor of STD testing. Noell et al[15] found that sex with an older partner was a significant predictor of incident STD among girls, whereas Beech et al[18] found older age and sexual orientation (homosexual/bisexual) to be positive predictors of STD status.

Behavioral Risk Associated With STD Prevalence

All studies in the review identified behavioral risk factors associated with STD prevalence. Homeless youth who experienced longer periods of homelessness were more likely to engage in high-risk sexual behaviors, such as alcohol and drug use, multiple sex partners, inconsistent use of condoms, violence, and survival sex. Two articles did not see a relationship between survival sex and STD status.[15,19] However, Beech et al[18] found a strong bivariate relationship between survival sex and positive HIV status.

Substance Use

Over half the articles (n = 5) assessed substance use. Current and lifetime alcohol and drug use was found to be associated with current and past STDs a history of an STD and current STD status.[18,19] Marijuana specifically was identified as a significant predictor of incident STDs in girls.[15] Youth reporting frequent alcohol use were more than twice as likely to report a previous STD.[22] One article, although reporting high rates of substance use among all study participants, did not report any association with STD status.[21]

Multiple Sex Partners

Four of six articles found that multiple sexual partners was associated with both a history of any STD as well as with incident STD.[15,17,18,21,23] When examining the relationship between multiple sex partners and specific STDs, a strong bivariate relationship was found with positive hepatitis B and C status[18] and, for youth, ages 15 to 20 years, with a diagnosis of chlamydia or gonorrhea.[17] Solorio et al[21] also found that having more than 3 sex partners was a positive predictor of STD testing. Tevendale et al[23] found that higher levels of decision making skills (frequency with which one considers options and possible consequences) was significantly associated with fewer sex partners in girls, although attendance at religious services was associated with more sex partners. In addition, positive expectations for the future were significantly associated with fewer sex partners for both boys and girls.

Condom Use

Associations with condom use were mixed. Of the seven articles examining condom use, only three looked at association between condom use and STD prevalence, of which only 1 article found incident STD and inconsistent condom use to be significantly associated.[15] Two articles found no reported relationship between condom use and STD acquisition and prevalence.[18,21] Tevendale et al[23] found that most youth in their study (70%) reported an unprotected sex act in the past 3 months. They did not examine associations with STD rates but they did find that boys who engaged in fewer unprotected sex acts exhibited higher levels of decision making and goal setting. This was not seen in girls, however, rather higher levels of self-esteem and having an adult mentor significantly predicted fewer unprotected sex acts for girls. Lastly, Valente and Auerswald[24] found that for both male and female homeless youth, condom use was more likely if their network contained a stably housed contact. They also found that young homeless women with a same-sex friend were more likely to use condoms at last intercourse.

Violence/Social Determinants of Health

Buffardi et al[22] was the only article in this review to report on associations between STD prevalence and violence and socioeconomic status. The study found that STD prevalence was strongly associated with being the victim of, or witness to, a crime. The study also reported childhood physical abuse and depression to be strongly associated with reported STD diagnosis in the prior year. Specifically, participants who had experienced these factors were more than twice as likely to report an STD diagnosis compared with those who had not. Housing insecurity and growing up in a low-income household were also strongly associated with reported STD diagnosis in the prior year.

DISCUSSION

In this review, we sought to document known STD prevalence estimates among homeless youth in the United States. Over the past 15 years, we found only 9 studies in the published literature that reported on STD estimates among homeless youth. Researchers and public health practitioners must therefore rely on a handful of cross sectional, convenience sample studies, many with small sample sizes, to provide a substitute for a prevalence estimate. Prevalence estimates ranged in the published literature from 6.4% to 32%. These estimates also varied by STD with higher rates seen in certain diseases and demographics. Chlamydia and gonorrhea were most commonly reported with rates ranging from 2.8% to 18.3% and from 0.4% to 24.9%, respectively. Human immunodeficiency virus, syphilis, and herpes were reported in less than half of the studies. Hepatitis B and C, HPV, genital warts, and trichomoniasis were the least likely to be reported.

Varying definitions of homelessness further complicate a calculation of a prevalence estimate because inconsistencies in how homelessness is defined can influence who is recruited into and measured in studies of homeless youth. The most referred to definition of homelessness, which underwent revision and was ultimately updated and finalized in 2012, was adapted from the US Department of Housing and Urban Development, which defines homelessness as, “ a person who resides in places not meant for human habitation, emergency shelter, transitional/supportive housing, is being evicted and has not identified a subsequent residence, fleeing domestic violence, being discharged from jail, a hospital, or other institution (for at least 30 days) and lacks the resources and support networks to obtain housing.”[25]

The STD data were assessed 2 ways, biologic sample collection and self-report. The majority of STD rates were self-reported, which may misrepresent the true STD prevalence among the homeless youth population, either through an underreporting of STDs due to the asymptomatic nature of many STDs, the stigma associated with having an STD, and the limited access to healthcare among this population or through an overestimation as a result of the timeframe used for data collection, for example, ever had an STD vs. had an STD in the past 30 days. Studies were also limited in geographic scope, with no studies from the Southeast or Northeast. Additionally, studies were primarily conducted in urban settings. Although individuals who are homeless tend to live in urban areas, rural homelessness does account for at least 7% of the homeless population.[26] Due to the limited geographical scope

of the studies, it is not known if STD prevalence estimates are influenced by location or if risk factors associated in one area contribute to STD risk in the same way as in other areas.

When reviewing for behaviors that may put youth at higher risk for STD acquisition, we found that STD rates were associated with the correlates one would expect including substance use, high-risk sexual behaviors and exposure to violence. Although directionality of these correlations is difficult to assess, we know that homeless youth are at risk for engaging in behaviors that put them at greater risk of an STD or HIV and the longer a youth is homeless, the more likely they will be to engage in behaviors that put them at increased risk for STD acquisition. Rapid and supportive housing (housing with services addressing the issues that may have contributed to the homeless event or its persistence) may help minimize the risk of STD acquisition. In the absence of rapid and/or supportive housing for homeless youth, linkages to low-risk peers and peer networks may minimize their risk while they are unstably housed.

Despite these limitations, some factors were identified that may influence STD rates in this population. Peers and peer social networks had significant protective effects on the sexual risk behaviors of homeless youth. Having a low-risk friend, a peer group member who was stably housed, and a same-sex friend for girls were all associated with homeless youth who engaged in more protective behaviors and exhibited higher levels of decision making, goal setting, self-esteem, and optimism.

Although the number of published studies limits our ability to document a national or regional STD prevalence estimate, findings from this literature review contribute to a better understanding of the burden of STDs among homeless youth, and might be able to assist agencies and organizations who serve this population. A better understanding of prevalence estimates in this group can help provide information to organizations and agencies that serve this population so that they may provide more salient services and referrals. Additionally, this information may help those agencies and organizations whose charge it is to prevent STDs/HIV by shedding light on the STD problem in this population and the factors associated with that risk, particularly as it relates to HIV prevention. Coordinated and regular data collection, including that of biological samples, from this population may lead to better information to ascertain a true prevalence rate, as well as improving the sexual health outcomes of homeless youth. Lastly, a standardized definition of homelessness would allow for cross-study comparisons and estimates.

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TABLE 1

Summary of Study Characteristics from Articles Included in the Systematic Review

Author(s) Publication Date	Sample Characteristics	Study Design	Definition of Homelessness	Date and Data collection	Recruitment
Noell et al. (2001)[15]	*Sample size* N = 536 *Age (y)* Females Range, 13–20 Mean, 17.7 Males Range, 14–20 Mean, 18.8 *Gender* 40.5% female 59.5% male *Race/*ethnicity 77% white 10.4% Native American Indian 3% Hispanic 2.8% black 1.1% Asian 5.7% other *Orientation* Not noted	RCT (baseline, 3 and 6 mo) 60.8% completed all 3 assessments (66.4% females, 57.1% males)	Spending more than 30 days total without parents or guardians in the previous 6 months, not living with parents or guardians, even temporarily, in the last 30 days, and not having a stable domicile	*Method* Face to face interviews (20–30 min) *Incentive* US $20 at baseline, US $30 at 3 mo, US $40 at 6 mo US $10–US $25 at monthly check-ins between assessments *Collection Date* 1994–1997 *Location* Streets of a large Northwestern city	*Method* Recruitment conducted in 3 separate successive waves Street observers conducted formative work *Locations* parks, street corners, parking lots, service agencies, and youth shelter
Rew et al. (2002)[16]	Sample size N = 414 *Age, y* Range, 16–20 Mean, 18.5 *Gender* 59% men 41% women *Race/ethnicity* 75.4% Anglo American *Orientation* 65% heterosexual 35% homosexual or bisexual	Exploratory design Convenience sample	Not Noted	*Method* Self-report Questionnaire *Incentive* US $10 *Collection Date* Not Noted *Location* Central Texas	*Method* Street outreach *Location* Street outreach program
Van Leeuwen et al. (2002)[17]	*Sample size* Not reported *Age, y* Not reported *Gender* Not reported *Race/ethnicity* Not reported *Orientation* Not reported	Cross-sectional Convenience sample	Not Reported	*Method* Survey (5–10 min) *Incentive* Transportation to STD clinic *Collection Date* Jan 2000 to Apr 2002 *Location* Denver, CO	*Method* Outreach workers recruited youth *Location* Park popular with homeless youth
Beech et al. (2003)[18]	*Sample size* N = 125 *Age, y* Range, 14–23	Cross-sectional	Not Reported	*Method* Face to face interviews (20 min) *Incentive*	*Method* Outreach workers recruited youth from shelters,

Author(s) Publication Date	Sample Characteristics	Study Design	Definition of Homelessness	Date and Data collection	Recruitment
	Gender 70% male 30% female *Race/ethnicity* 37% AA 42% white 21% Hispanic, American Indian, or Biracial *Orientation* Not noted			Undisclosed monetary compensation *Collection Date* Not Reported *Location* Large Southwest city	temporary facilities, and street-based using a snowball sampling method over a 2-week period *Location* Not Reported
Halcon and Lifson (2004)[19]	*Sample size* N = 203 *Age, y* Range, 15–22 Mean, 19.2 for males and 18.4 for females *Gender* 40.4% female 59.6% male *Race/ethnicity* 47% white 27.7% AA 25.3% other “Other” 5% Hispanic 4% Asian/Pacific Islander 9% Native American 8% more than one racial/ethnic category *Orientation* Not noted	Cross-sectional Community-based sampling	Homeless at least 1 mo in the past year, during which time homeless at least half of those days, able to give informed consent	*Method* Face to face interviews (20–30 min) *Incentive* US $20 vouchers *Collection Date* 1998–1999 *Location* Minneapolis, MN	*Method* Outreach workers recruited youth *Locations* Coffee shops, restaurants, parks, meal-serving sites river/railroad tracks,
Rew et al. (2005)[20]	*Sample size* N = 425 *Age, y* Range, 16–20 *Gender* 58% males 42% females *Race/ethnicity* Not noted	Secondary analysis Nonprobability sample	Not Noted	*Method* Self-report Questionnaire *Incentive* US $10 *Collection Date* Not Noted *Location* Urban, south central US	*Method* Street outreach *Location* Street outreach program
Solorio et al. (2006)[21]	*Sample size* N = 261 *Age, y* Range, 12–20 Mean, 15.4 *Gender* 60% female *Race/ethnicity* 44% Latino 23% AA 20% White 13% mixed race	Cross-sectional Subsample of a larger, longitudinal study	Spent at least 2 consecutive nights but less than 6 months away from home without parent/guardian’s consent or if under 17 years, been told to leave their home	*Method* Face to face interviews (1 hr) *Incentive* US $20 Cash *Collection Date* 2001–2002 *Location* Los Angeles County, CA	*Method* Interviewers sent to predetermined sites to recruit youth *Locations* Shelters, drop-in centers, street hang-outs

Author(s) Publication Date	Sample Characteristics	Study Design	Definition of Homelessness	Date and Data collection	Recruitment
	Orientation 84% heterosexual				
Buffardi et al. (2008)[22]	*Sample size* N = 90,000 participated in school-based survey n = 20,748 also completed more detailed questionnaire n = 15,197 completed computer-assisted survey n = 14,012 provided urine for STD testing *Gender* Not noted *Age, y* 18–27 *Race/ethnicity* Not noted *Orientation* Not noted	Stratified, school-based random sampling	Not Noted	*Method* School-based survey, in-home questionnaire, computer-assisted survey *Incentive* Not Noted *Collection Date* 1994 July 2001-April 2002 *Location* United States	*Method* National Longitudinal Study of Adolescent Health *Location* Not Noted
Tevendale et al. (2009)[23]	*Sample size* N = 302 *Gender* 55.7% male 44.3% female *Age, y* 14–21 Mean, 18.8 *Race/ethnicity* 19.8% White 24.5% African American 25.0% Hispanic/Latino 25.0% Mixed 5.7% Other *Orientation* Not noted	Cross-sectional study	Not Noted	*Method* Audio computer-administered self-interview survey (1.5 h) *Incentive* US $20 *Collection Date* 2004–2005 *Location* Los Angeles County, CA	*Method* Field interviewers recruited youth *Location* Drop-in centers and shelters
Valente and Auerswald (2013)[24]	*Sample size* N =258 *Age, y* Range: 15–24 Median: male, 21 female, 20 *Gender* 64% male 36% female *Race/ethnicity* 54.5% white 45.5% nonwhite	Cross-sectional study Venue-based sampling Substudy of a larger, longitudinal study San Francisco	Having to stay 2 or more nights at a place that is not your home or homeless in the prior 6 months	*Method* Audio computer-administered self-interview survey (30–45 min) and article-based social network survey (15 min) *Incentive* US $20 Survey US $10 STD testing *Collection date* Not Noted *Location* San Francisco, CA	*Method* Outreach workers recruited youth *Location* Street venues, transitional housing programs

TABLE 2

Summary of STD Prevalence Estimates From Articles Included in the Systematic Review

Author(s) Publication Date	Study	STD	STD Prevalence Rates	Other
Noell et al. (2001)[15]	*Sample size* N = 536	*STD assessment* Biologic sample: urine and blood *Period assessed* 1994–1997 *Specific STDs tested for in study* Chlamydia (CT), herpes, hepatitis B, hepatitis C	Positive for CT Males, 4.73% (n = 15/319) Females, 6.45% (n = 14/217) Positive for HSV-2 Males, 5.52% (n = 17) Females, 11.85% (n = 25) Positive for HBV Males, 4.19% (n = 13) Females, 1.42% (n = 3) Positive for HCV Males, 4.84% (n = 15) Females, 3.77% (n = 8)	• STD incidence higher among females than males (16.7% vs. 9.8%) • HCV infection incidence higher among males than females (11.6% vs. 0%)
Rew et al. (2002)[16]	*Sample size* N = 414	*STD assessment* Self-report (no timeframe reported) *Period assessed* Not reported *Specific STDs asked about in study* GC, CT, syphilis	Positive for GC 117 (37.9%) tested, 103 (24.9%) diagnosed, 100 (24.2%) treated Positive for CT 88 (21.3%) tested, 36 (8.7%) diagnosed, 34 (8.2%) treated Positive for syphilis 79 (19.1%) tested, 16 (3.9%) diagnosed, 15 (3.6%) treated	
Van Leeuwen et al. (2002)[17]	*Sample size* Not reported	*STD assessment* Biologic sample: urine *Period assessed* Not reported *Specific STDs tested for in study* GC, CT	• 414 CT and 302 GC tests were performed Positive for CT, 11.6% Positive for GC, 2.6%	
Beech et al. (2003)[18]	*Sample size* N = 125	*STD assessment* Biologic Sample: blood *Period assessed* Not reported *Specific STDs tested for in study* Hepatitis B, hepatitis C	Positive for HBV, 17% Positive for HCV, 12%	
Halcon and Lifson (2004)[19]	*Sample Size* N = 203	*STD assessment* Self-report (ever) *Period assessed* 1998–1999 *Specific STDs asked about in study* Gonorrhea (GC), syphilis, chlamydia (CT), herpes, genital warts, hepatitis B, hepatitis C, crabs	• 31.5% of participants reported a history of at least one STD [history of any STD (males n = 27;females n = 37)/total participants involved in sexual risks (n = 103)] Positive for GC, 9.9% Positive for syphilis, 3.5% Positive for CT,* 18.3% Females, 31.7% Males, 9.2% Positive for herpes, 4.4% Positive for genital warts, 3.5% Positive for hepatitis B, 5.9% • 7 youth reported a history of crabs *Chlamydia was the only STD that was broken out by sex	
Rew et al. (2005)[20]	*Sample size* N = 425	*STD Assessment* Self-Report (ever)	Positive for GC Gay/lesbian, 33%	

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		Period assessed Not reported *Specific STDs asked about in study* GC, CT, syphilis	Bisexual, 40% Heterosexual, 19% Positive for CT Gay/lesbian, 11% Bisexual, 11% Heterosexual, 8% Positive for syphilis Gay/lesbian, 5% Bisexual, 4% Heterosexual, 3%	
Solorio et al. (2006)[21]	*Sample size* N = 261 n = 131 sexually active in 3 mo prior	*STD assessment* Self-report (past 3 mo) *Period assessed* 2001–2002 *Specific STDs asked about in study* Not reported	• Overall positivity rate was 32% [total STD positive (n = 19)/total received STD test (n = 60)] • 46% of females were STD positive [received STD test (n = 37)/STD test positive (n = 17)] • 9% of males were STD positive [received STD test (n = 23)/STD test positive (n = 2)]	
Buffardi et al. (2008)[22]	*Sample size* N = 90,000 participated in school-based survey n = 20,748 also completed more detailed questionnaire n = 15,197 completed computer-assisted survey n = 14,012 provided urine for STD testing	*STD assessment* Biologic sample: urine Self-report (past 12 mo) *Period assessed* 1994 July 2001 to April 2002 *Specific STDs asked about and tested for in study* GC, CT, syphilis, *T vaginalis*, *M genitalium*, HPV, herpes	• Prevalent STD (n = 11,594) • STD diagnoses in the previous year (n = 14,058) Positive for CT 4.2% Positive for GC 0.4% Positive for *T. vaginalis* 2.3% • Combined prevalence of self-reported STD diagnosis in the last 12 months was 6.4% (2.8% CT, 1.3% HPV, 1.3% genital warts, 1.1% herpes, 1.0% GC, 0.7% *T. vaginalis,* 0.2% syphilis) • HPV was detected in 26.9% of tested women	
Tevendale et al. (2009)[23]	*Sample Size* N = 302 n = 192 youth who reported that they had engaged in vaginal or anal sex 3 mo prior	*STD assessment* Self-report (ever and past 3 mo) *Period assessed* 2004–2005 *Specific STDs asked about in study* CT, syphilis, herpes, NGU, HPV, trichomonas	Diagnosed with an STD in 3 mo prior All youth, 9.4% Females, 19.1% Males, 1.9% Diagnosed with an STD in their lifetime All youth, 23.6% Females, 36.9% Males, 13.1%	
Valente and Auerswald CL (2013)[24]	*Sample size* N =258	*STD assessment* Biologic sample: urine *Period assessed* Not reported *Specific STDs tested for in study* GC, CT	Positive for CT/GC Female, 11.0% Male, 4.8%	• No male with a housed contact was positive for an STI, whereas 9.9% of males without a housed contact were positive ($P = .003$) • Young men who named a same sex friend had decreased likelihood of

Author(s) Publication Date	Study	STD	STD Prevalence Rates	Other
				having an STD (OR, .16; 95% CI, 0.03–0.80; *P* = .026)